1376130

PATENT SPECIFICATION

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(19)

(54) PROCESS FOR MANUFACTURE OF A GLASS FIBRE MAT

(71) I, WERNER HUGO WILHELM SCHULLER, of Goethestrasse 21—1V, 8 Munchen 15, Germany, of German nationality, do hereby declare the invention, for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to the manufacture of thin sheeting, tissue or mat from glass fibres suspended in water, the suspension being transferred to a moving, sieve-like, pervious support where water is removed the suspension being subsequently dried.

It is known in the paper manufacturing industry to form a slurry by suspending pulp or other organic fibres in water and to carry the slurry on a sieve-like belt to and over a felt belt to remove water from the slurry for example over 95% of the water content, and to carry the slurry at a high speed to and through a drying system consisting of a number of steam or oil-heated drums. This traditional wet paper making method above described is hereinafter referred to as the "traditional wet paper making method."

It is also known, to produce a sheet, tissue or mat of inorganic materials, especially glass fibres, whereby the fibres made from glass rods or marble bushings are of varying lengths for example between 10 inches and 40 inches long which are removed by a scraper or blade from the surface of a fast rotating drum and carried by a current of air to a number of distributing devices and deposited in a zig-zag movement on a sieve-like belt, whence such sheet, tissue or mat is carried to and through a binder bath, containing a solution, usually 2%, of a thermoplastic binder agent, and then carried in this condition through a dryer. This process is hereinafter called the "traditional dry mat process".

It will be appreciated that when suspended in water glass fibres remain substantially unaffected by the water in contradistinction to wood pulp fibres which are, to some extent, pervious and soak in water like a tissue paper. Furthermore wood pulp fibres have a natural content of glycose, so that it is not necessary to add a binder agent as is essential with glass fibres. The differences in material characteristics between glass fibres and pulp fibres create problems in producing a wet mat of glass fibres with sufficient strength to permit the wet mat to be carried continuously and at high speed from the mat forming station over a suction device through a thermoplastic binder bath and into a drying oven without distortion.

Extensive tests have been carried out in an attempt to replace the organic pulp fibres of the traditional wet paper making method by inorganic glass fibres, but with no success. If the glass fibres used are cut to a length less than ¼ of one inch, than the mat formed has insufficient strength to permit it being carried at high speed through a binder bath containing a thermoplastic material and provide a finished product without wrinkles or distortion and with the necessary strength to permit the processing of such material, for example, into a roofing material. The technical improvement of materials, especially roofing materials now demands a more even fibre distribution but while the traditional dry mat process produces by its long glass staples a mat of high strength, especially in the longitudinal direction of the mat, it has not been possible in many years to deposit the long staples evenly enough on a sieve-like belt to provide the uniformity required with the result that the uneveness of fibres distribution has caused, in the binder bath, uneven strength over the width of the mat.

According to the invention there is provided a process for manufacture of glass fibre mat in which chopped glass fibres are carried to a mixing tank containing water and therein mixed with water by mixing means to form a water-glass fibre suspension which is thereafter transported to a position above a continuous moving sieve-like, pervious support where substantially 75% to 90% of the water

content is removed from the suspension simultaneously with deposition of the chopped fibres on the support to produce a mat of staple fibres, thereafter a suitable binding agent being added to the mat and the mat dried.

Thus the invention provides a process for producing a mat of glass staple fibres by depositing a water-glass fibre float on a water-pervious, sieve-like belt, removing from 75% to 90% of the water content, carrying the float on a second speed-synchronized pervious sieve-like belt to and through a binder bath containing a thermoplastic binder agent to a third speed-synchronized belt which carries the finished mat through a dryer.

In operation staple fibres with staples, for example, of a length of ¼ of one inch up to one inch, are used.

In operation a thermoplastic material is added to the binder bath in sufficient concentration to leave in the finished product a binder content of 10% to 30% of the weight of the finished material.

An embodiment of apparatus for carrying out the process of the invention is illustrated, by way of example, in the drawings accompanying the provisional Specification, in which:—

Figure 1 is a vertical section elevation of part of a plant producing glass fibres mat in which a water-glass fibre suspension is carried by a first pervious, sieve-like continuous belt provided with a suction device, to form a glass fibre mat, the mat being then carried by a second sieve-like belt to and through a binder bath and finally by a third continuous belt leading to and through a dryer;

Figure 2 is a plan view of Figure 1; and

Figure 3 illustrates schematically the complete mat making process according to the invention.

In a preferred construction the water-glass fibre suspension is formed, as illustrated in Figure 3, in a container with a rotor agitator for mixing the fibres.

In the part of the plant illustrated in Figure 1 the water-glass fibre suspension is carried under high pressure, for example through a pump and pipes (not shown) to flow at a high rate and to produce and transfer substantial quantities of the water-glass fibre suspension to a continuously moving sieve-like first belt 2, on which the water-glass fibre suspension is deposited. Under the belt 2 is a system of suction channels 6 and 7, connected to a source creating suction, to remove from the water-glass fibre suspension 75% to 90% of the water content. The extracted water is recirculated to the tank for use in forming fresh water-glass fibre suspension. The desired thickness of mat on the belt 2 is achieved by adjustment of the speed of the belt 2 in relation to the rate of supply of the water-glass fibre suspension. The speed of the belt 2 is normally from 60 feet per minute up to 300 feet per minute but may be increased even further if desired. The belt 2 is driven by a roller 3 in conjunction with rollers 4 and kept under tension by rollers 5. Over the belt 2 is another belt 2*a* driven by rollers 3*a* and 4*a* and kept under tension by roller 5*a*. The shafts of rollers 3 and 3*a* are synchronised (by means not shown in the drawings) to operate at the same speed. Because of difficulties which arise in ensuring that the smooth surface of glass fibres moving at a high speed takes on sufficient binder to produce the required strength of mat the binder application is divided into two stages on a second belt system 8 driven by roller 9 and kept under tension by rollers 13. In the first stage the binder is sprayed by several nozzles 18 which are located above the belt 8 for the purpose of spraying binder upon the the surface of the wet mat 17 and in the second stage the binder is applied in a binder bath 12.

The process hereinbefore described using a combination of binder spray and binder bath has proved effective in applying not only sufficient binder to the surface of thee glass fibres but also a desired binder content, which should be, depending on the proposed use of the finished mat, between 10% and 30% of the mat weight.

The belts 2 and 8 are kept clean by passage through a washer (not shown). The washing can best be achieved by high pressure water nozzles (not shown). If washing of the belts were omitted, the fibres would stick on the surface of the belts and after a short period the operation would have to be stopped.

For high speed production the mat 17 on the surface of the belt 8 is carried by the belt through the binder bath 12. The speed of the drive shafts of rollers 9 is synchronised with the speed of drive shafts or rollers 3.

The wet mat 17 on leaving the binder bath 12 is passed to a dryer 16 on a continuous belt 14 which is supported by a roller 15 and passes through a temperature controlled belt-dryer which may be of known construction. Since 75% to 90% of the liquid in the suspension mat has previously been removed, the length of the dryer, even for high speed production, is much shorter than the conventional dryer of the traditional dry mat process and the saving of heat for drying purposes is considerable.

Referring now to Figure 3, which illustrates the whole process of the invention, chopped glass fibres, produced by any known process are fed into a hopper 20. A fully automatic weighing conveyor 21 periodically feeds a pre-determined quantity of fibres into a premixing container 22, equipped with a rotor agitator 23 driven by a motor 24 and containing sufficient water to produce a concentrated suspension. Through a system of

pipes 25 this concentrated suspension is fed alternately to one of two service vats 26 equipped with a rotor agitator 27 driven by a motor 28 to keep the suspension in motion and prevent precipitation of the fibres. A material handling pump 29 forces the concentrated suspension under high pressure through a system of pipes 30 into another pipe-system 31, where it is mixed with, and thus diluted to a predetermined concentration by, recycled water which has been collected in a container 33.

A pump 32 adapted for handling large volumes raises the water glass-fibre suspension to a position from which it is transferred to the continuous moving sieve-like belt 2. Any overflow of water is collected in a container 34 and trimmed fibres from the mat forming process are collected in a container 35 and recycled, by a pump 36, to the premixing container 22.

If desired another system of spray nozzles may be installed between rollers 10 and 15 to apply an even higher concentration of binder which may be either of the same formula as applied in the binder bath 12 or of a different formula.

WHAT I CLAIM IS:—

1. A process for manufacture of a glass fibre mat in which chopped glass fibres are carried to a mixing tank containing water and therein mixed with water by mixing means to form a water-glass fibre suspension which is thereafter transported to a position above a continuous moving sieve-like, pervious support where substantially 75% to 90% of the water content is removed from the suspension simultaneously with deposition of the chopped fibres on the support to produce a mat of staple fibres, thereafter a suitable binding agent being added to the mat and the mat dried.

2. A process according to Claim 1, in which the water content of the mat of staple fibres on a first sieve-like pervious support is removed by a suction device, the mat being then carried on a second sieve-like pervious support, the speed of which is synchronised with said first support, to and through a binder bath containing a thermoplastic binder agent and past binder dispensing nozzles to a third support, the speed of which is synchronised with said first and second supports, which carries the mat through a dryer.

3. A process according to Claim 1 or Claim 2, in which the fibres are of a length of ¼ of one inch up to one inch.

4. A process according to any one of the preceding claims in which water removed from the water-glass fibre suspension is recycled to the mixing tank.

5. A process according to Claim 2 or claim 3 or claim 4 as appendant to claim 2 in which a thermoplastic material is present in the binder bath in sufficient concentration to provide in the mat a binder content of 10% to 30% of the weight of the mat.

6. A process for manufacture of a glass fibre mat substantially as hereinbefore described and illustrated in the drawings accompanying the Provisional Specification.

7. A glass fibre mat whenever produced by a process according to any one of the preceding claims.

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1376130 PROVISIONAL SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

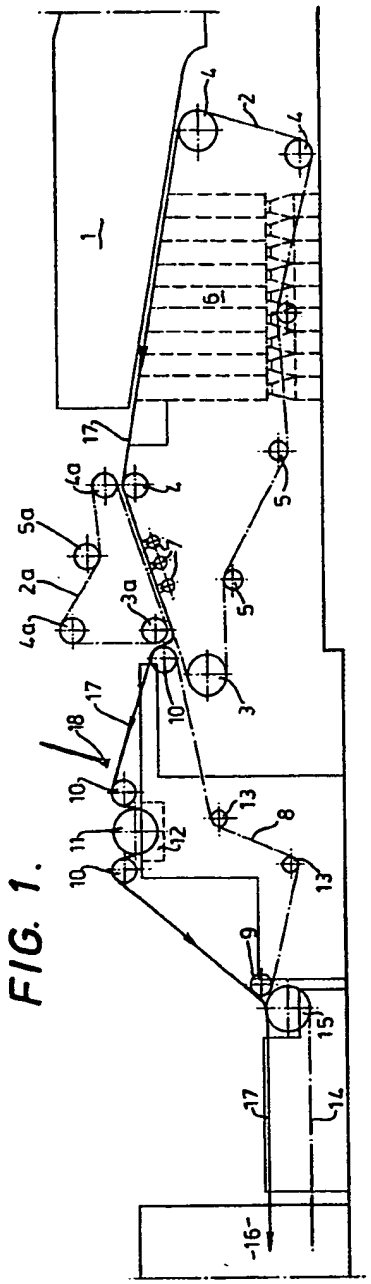

FIG. 1.

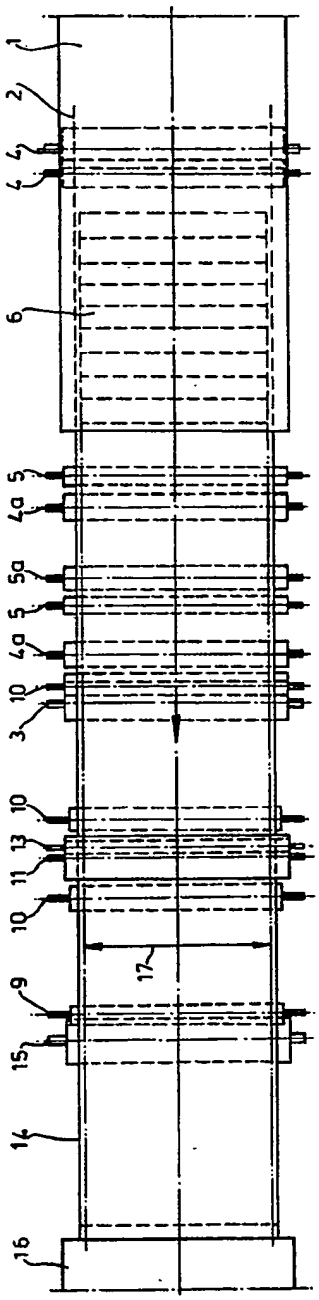

FIG. 2.

1376130 PROVISIONAL SPECIFICATION
3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 3

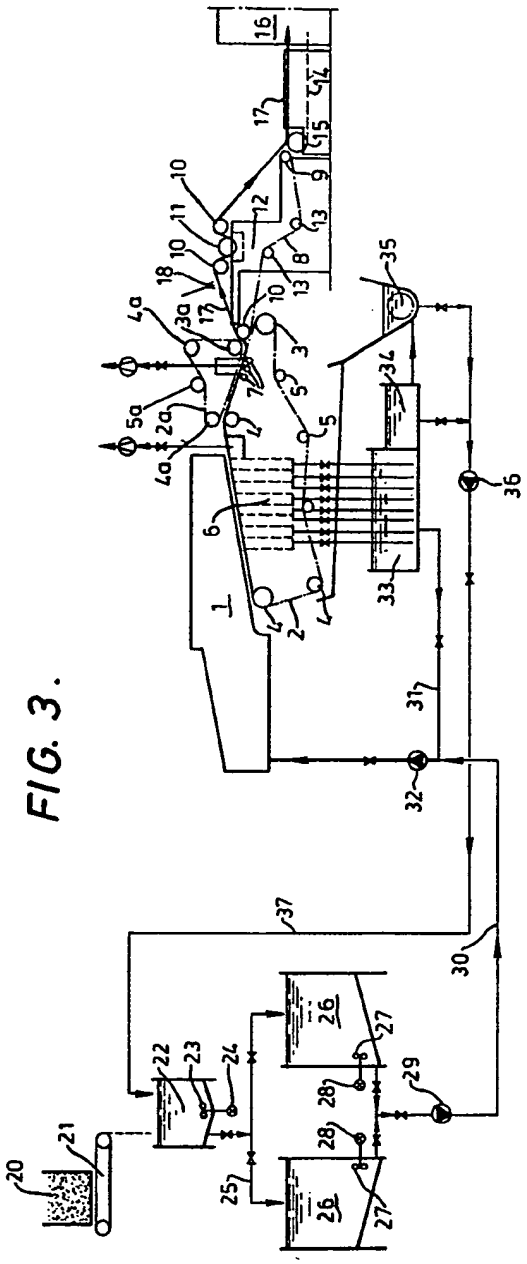

FIG. 3.